

## **Sandia National Laboratories**

### **Primary Hazard Screening (PHS)**

**PHS Number: SNL10A00226-001**

**CINT IL: Thermal Processing Equipment**

I. Signatures (Electronic signature dates shown)
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## Risk Management Determination

Hazard Classification: **Low**Required Documentation: **PHS with integral HA**Facility/Project Designator: **Non-nuclear Facility**Date Created: **07/15/2010**DOE Order References: **425.1C**Results as of: **01/31/2011**Submitted for Review by: **Nogan,John**

Org: 01132 Date: 01/04/2011

## Author / Technical Review

I am knowledgeable of the activities and hazards covered by this PHS and, after doing due diligence, the description, notes, identified hazards, analyses, and other information contained in this PHS are complete and accurate.

Author: **Nogan,John**Org: **01132**CONCUR ON SUBMIT:  
**01/04/2011**

I have performed the above reviews and concur that those items are complete and accurate.

Industrial Facility Safety Basis SME:  
**Stirrup,Timothy Scott**Org: **04126**CONCUR: **01/25/2011**

## ES&amp;H Coordinator Review

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have performed the above reviews and concur that those items are complete and accurate.

ES&H Coordinator: **Starr,Michael**Org: **01131**CONCUR: **01/25/2011**

## Quality Review

This PHS meets minimum Corporate standards for 1) description/notes and 2) required information. There are no gross inconsistencies. I have performed the above reviews and concur that those items are complete and accurate.

PHS Team: **Hall, Christopher Armando**

Org: **04126**

CONCUR: **01/26/2011**

### Approver

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have reviewed this PHS and concur that its contents are accurate and complete. I will ensure that the requirements and commitments in this PHS are implemented prior to the start of work.

Approving Manager:: **Hearne, Sean J.**

Org: **01132**

APPROVE: **01/31/2011**

## II. PHS Purpose, Limitations, and Use in Work Planning and Control

### Purpose of the PHS

For the scope of work identified, the PHS identifies:

- High-level (primary) hazards (e.g. chemicals, toxic gasses, explosives)
- Some, but not all controls (e.g. PPE, respirators, ventilation, lockout/tagout, and NEPA), please see the limitations section, below for additional information.
- A Hazard Classification, which determines the requirements for additional Safety Basis documents [e.g., Hazard Analysis (HA), Safety Assessment (SA), Safety Assessment Document (SAD), Documented Safety Analysis (DSA) etc.]
- For the hazards and controls identified, the PHS enables the identification and communication of:
  - Requirements documents (such as ES&H Manual chapters, sections, and supplements) that must be reviewed to determine specific requirements applicable to the work.
  - ES&H Manual-required training
  - Action and Warning messages that highlight key requirements.

The Hazard Analysis section of the PHS is used to perform a high-level hazards analysis and controls selection for hazards with a Hazard Classification of 'Low' and, optionally, for Standard Industrial Hazards (SIH).

### Limitations of the PHS for Use in Activity-level Work Planning and Control

Unless additional information is specifically added, a PHS **does not** contain all of the detail necessary to identify and control hazards at the activity/task level. The reasons for this include:

- PHSs are typically written at the project or work-area level and therefore, do not contain sufficient detail about individual tasks or the hazards/controls associated with them.
- While the PHS provides requirements for the hazards and controls identified, it **does not** provide a comprehensive list of all requirements in the ES&H Manual and related documents. Furthermore, many of the requirements are identified by reference to sections of the ES&H Manual, which must be evaluated for requirements applicable to the specific work being performed.
- It is impractical to ask enough questions to generate the level of detail necessary for activity/task-level hazard identification and control; human analysis must be employed. Consequently, details must be developed by a work planner, including:
  - Specific details about the hazard (e.g. what chemical, which laser, when, under what conditions, and where)
  - Other controls needed, since the only controls automatically identified are the ones with ES&H Manual requirements that result from their use. Important controls, such as access control, interlocks, shielding, monitoring, and personnel qualifications are not identified.
  - Specificity about controls (e.g. type of PPE, ventilation specifications)
  - Details on how and when you implement each control
  - Information on who needs to take what training

## Recommended Use of the PHS to Support Activity-Level Work Planning & Control

The information developed in the PHS and any resultant Safety Basis documents should be utilized when performing the subsequent task of activity-level hazard identification, analysis, and control selection, where (1) the major work steps are identified; (2) the hazards associated with each major step are identified and analyzed; and (3) the controls for each hazard are identified and verified to be adequate to protect the involved workers. For the vast majority of work performed at Sandia, the Job Safety Analysis form (SF 2001-JSA) or equivalent is the recommended tool to use for this purpose. The JSA provides a systematic process for a team of involved workers and SMEs to ensure the activity-level work scope is rigorously analyzed to identify all potential hazards and specify appropriate controls for each hazard. Information from the PHS and Safety Basis documents is used as an input in developing the JSA, and the results of the JSA are used to develop TWDs, procedures, or other work instructions as appropriate.

In some cases, the PHS system may be used for activity level hazard identification, analysis, and controls identification, however, the PHS usually must be supplemented with additional information to provide the level of detail necessary to serve this purpose. In these cases, a PHS should be designated as an "Activity-Level PHS" on the PHS General Information page; however, these PHSs will be reviewed during the review and approval process to confirm that they contain the detail necessary to identify the hazards and controls at any stage of the work being performed. If determined to not be adequate, options include (1) revising the PHS to include adequate information; or (2) removing the "Activity-Level PHS" designation, and using a JSA/JSA-equivalent process to perform activity-level hazard identification, analysis, and control selection.

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### III. General Information

#### Document Status

Question Set Version: J

Status: **APPROVED**

Expiration Date: **01/31/2012**

Responsible Organization: **01132**

#### Radiological Protection Level

Radiological Protection Level for this facility of project: **None**

#### Description

Bay 1532 has a horizontal, four chamber Low Pressure Chemical Vapor Deposition (LPCVD)/Diffusion Furnace. The LPCVD portion of the furnace provides a method to deposit high quality thin films which include undoped polysilicon, low stress and stoichiometric silicon nitride, and thick silicon dioxide. The diffusion chamber allows for thermal oxidation of silicon substrates and high temperature annealing.

Toxic, pyrophoric and flammable liquids and gases for the various LPCVD processes are either contained within the tool or in chases 1528 and 1533. Non-toxic gasses are stored in chase 1530 and are distributed into chase 1533. Tetraethyl orthosilicate (TEOS), a flammable liquid, is stored in a specially designed enclosure within the tool. The ammonia (NH<sub>3</sub>), dichlorosilane (DCS) and silane (SiH<sub>4</sub>) are stored in independent fully automatic gas cabinets. The DCS gas cabinet located in 1533 will only supply gas to the LPCVD furnace. However the NH<sub>3</sub> gas cabinet (1533) and the SiH<sub>4</sub> gas cabinet (1527) will share resources with other tools in the Integration Lab.

There are toxic gas monitoring sensors for NH<sub>3</sub>, SiH<sub>4</sub> and DCS located in the LPCVD furnace's source cabinet(1532) and in chase 1533. Both the DCS and NH<sub>3</sub> gas cabinets contain gas specific sensors. The DCS gas cabinet is also equipped with an infrared flame detector.

The Toxic Gas Monitoring System (TGMS) system is comprised of a decentralized Life Safety Network based on the LonWorks Technology with intelligent network nodes. The digitally networked input/output devices will notify personnel and shut down equipment based on a program customized for the requirements of the CINT Integration Labs.

Network devices include Honeywell (MST Technology) Satellite FTT gas monitors, Echelon digital interface modules, bus monitors, a Local Information Display and DVS (Data Visualization System). Output devices include beacons/horns, relay shut down of gases and signals to the Sandia Fire Protection panel for notification to the Sandia Emergency Operation Center.

#### Notes



**General Document Notes**

## Locations

Site	textArea	Building	Room	Description
<b>Primary Location</b>				
SSTP	No Tech Area	518	1532	Flexbay 1532 - CINT Integration Lab
<b>Other Locations</b>				
SSTP	No Tech Area	518	1533	Equipment Chase 1533 - CINT Integration Lab

## Responsible Organization History

Organization Number	Effective (Starting) Date	This Org. Submitted Document for Review
01132	07/15/2010	Y

## Planned Changes

IV. Identified Hazards		
Hazard Name	Hazard Description	Source (Question or Table)
traffic related hazards	traffic related hazards for injury	Required by general corporate business process
common electrical hazards	common electrical hazards	Required by general corporate business process
Hazards that could impact Roving Personnel or Visitors	Roving Personnel or Visitors entering work area	Required by general corporate business process
Use or storage of chemicals	Potential personnel exposure to chemicals & fire protection regulatory requirements	QUESTION 5
Unevaluated chemical use	potential chemical overexposure	QUESTION 5a
Standard industrial levels of chemicals	Corrosive chemical; Potential exposure to skin and eyes.	QUESTION 5e
Noncompliant storage, dispensing, or use of flammable/combustible liquids could cause fire/explosion.	fire/explosion hazard	QUESTION 5g
Chemical physical hazards	hazards from fires, reactions, and explosions	QUESTION 5h
Use or storage of flammable gasses	Potential fire and explosion	QUESTION 5h(1)a
Toxic gasses	Potential exposure to toxic gasses in the event of a release	QUESTION 5j(1)
Exposed and energized electrical circuits	potential electrical shock or arc	QUESTION 6a
Circuit Breakers or disconnect switches at 50 V or more	potential electrical arc from operating circuit breakers or disconnect switches	QUESTION 6b
Electrical equipment operating at 50V or greater that is not NRTL-approved	unknown hazard potential since items have not gone through the standards, testing rigor, and hazard analysis associated with an NRTL-evaluation	QUESTION 6d(1)
Standard industrial mechanical hazards	potential injury from mechanical forces	QUESTION 7
Portable power tools	potential injury from portable power tools	QUESTION 7b
Standard industrial pressure hazard(s)	Injury or damage	QUESTION 10
Unevaluated Noise	potential hearing damage	QUESTION 11a
Environmental concern below LOW hazard classification requirements.	potential for regulatory action	QUESTION 15
Wastewater discharge, SIH hazard	potential to exceed permitted amounts	QUESTION 15a

Hazard Name	Hazard Description	Source (Question or Table)
<b>General Wastewater discharge, SIH hazard</b>	potential to exceed permitted amounts	QUESTION 15a(1)
<b>Air discharge, SIH hazard</b>	potential to emit regulated contaminants	QUESTION 15b
<b>Construction disturbing the soil</b>	potential for regulatory action	QUESTION 15b(4)
<b>Hazardous Wastes</b>	potential for regulatory action	QUESTION 15d
<b>Hot Work</b>	potential for fire or burn from hot work	QUESTION 17b
<b>Roving personnel may encounter hazards that change over time</b>	hazards associated with the site's other activities	QUESTION 21a
<b>Low-Level Offsite Hazardous Work Condition</b>	Hazards encountered while conducting work offsite by members of the workforce	QUESTION 21b(1)a
<b>Domestic travel</b>	hazards associated with domestic travel	QUESTION 21d
<b>work area hazards</b>	unexpected hazards encountered by roving personnel while performing other work	QUESTION 22
<b>Unevaluated hazards</b>	hazards that may require PPE	QUESTION C2a
<b>Exposure to hazardous energy</b>	potential injury to personnel from exposure to hazardous energy	QUESTION C3

## V. Required Actions

### Warning Messages

1. There are a variety of requirements applicable to chemicals. Refer to the portions of Corporate Policy: ESH100, Environment, Safety and Health relevant to the activities being performed for requirements.

**Response:** All requirements are adhered to by lab personnel.

2. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program, as implemented through various Sandia requirement documents (e.g., PG470246, 10 CFR 851 Worker Safety and Health Program Plan), requires an exposure assessment of chemical hazards to ensure hazards have been identified and prevented or abated.

**Response:** IH will be contacted to perform an assessment.

3. Flammable and combustible liquids must be bonded in accordance with the requirements in: The Sandia, "Record of Code Decision."

**Response:** The Sandia, "Record of Code Decision," requirements will be reviewed and the implemented as necessary.

4. Any activity inside the Limited Approach Boundary is considered working near energized parts and requires a senior-manager-approved technical work document (TWD).

**Response:** Any activity performed inside the Limited Approach Boundary will be approved by a senior-manager-approved technical work document (TWD).

5. All operators of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PQF) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure operators.

**Response:** Personnel considered pressure operators have completed the necessary training.

6. All installers of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PIQ) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure installers.

**Response:** Personnel considered pressure installers have completed the necessary training.

7. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program (PG470246), as implemented through various Sandia requirement documents (e.g., Corporate Policy ESH100, Environment, Safety and Health), requires an exposure assessment of chemical, physical, and/or biological hazards to ensure hazards have been identified and prevented or abated.

**Response:** IH will be contacted to perform an assessment.

8. There may also be requirements for waste minimization and documentation of waste minimization efforts/results. Contact the Pollution Prevention Team for assistance with waste minimization.

**Response:** The Pollution Prevention team will be contacted if needed for waste minimization requirements and documentation of waste minimization efforts/results.

9. There may be hazards from other operations at the host site that could affect workers covered by this PHS; these hazards may change over time. Identify these hazards and any required safeguards to workers. This often involves establishing ongoing communications with the host facility about their hazards and required safeguards. You can also refer to Sandia's Roving Personnel Guidelines for additional information.

**Response:** Each MOW who works in a laboratory reads the appropriate TWDs and signs them. The Safe Work Practice (SWP) aspect of the Center 1100 WP&C identifies hazards and controls in the lab and personnel are 'approved' by the lab owner to work with only those hazards that they have been trained on. This approval is completed by the lab owner initialling the SWP.

10. Implement the required precautions before entering someone else's non-office work area, (e.g., required PPE, training, procedure review, briefing, escort, etc.). This may involve ongoing communications with the space owner, as hazards and required safeguards may change over time. Sandia's Roving Personnel Guidelines provide additional guidance.

**Response:** Each MOW who works in a laboratory reads the appropriate TWDs and signs them. The Safe Work Practice (SWP) aspect of the Center 1100 WP&C identifies hazards and controls in the lab and personnel are 'approved' by the lab owner to work with only those hazards that they have been trained on. This approval is completed by the lab owner initialling the SWP.

11. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program (PG470246), as implemented through various Sandia requirement documents (e.g., Corporate Policy ESH100, Environment, Safety and Health), requires an exposure assessment of chemical, physical, and/or biological hazards to ensure hazards have been identified and prevented or abated.

**Response:** IH will be contacted to perform an assessment.

12. All contractors performing servicing and maintenance on SNL-owned equipment shall perform LOTO when required in accordance with 29 CFR 1910.147 (OSHA Standards for General Industry) and comply with the following two additional requirements: (1) The contractor shall be briefed on SNL-specific LOTO devices and procedures applicable to the equipment under maintenance. (2) The contractor shall inform the SNL equipment owner and other authorized or affected workers of the contractor's energy control procedure/process, including any differences between that process and SNL-specific requirements.

**Response:** All LOTO requirements in accordance with 29 CFR 1910.147 (OSHA Standards for General Industry) will be followed.

13. Equipment specific procedures are required for servicing and maintenance according to the requirements of Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)."

**Response:** Equipment specific procedures will be developed for servicing and maintenance according to the requirements of Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)."

14. Control of hazardous energy ONLY for protection of configuration, equipment, or property is administrative control. LOTO locks and tags shall not be used for administrative control (see CPR400.1.1.7/ GN470037, Administrative Control Procedure).

**Response:** LOTO locks and tags are used for control of hazardous energy.

**15.** Implement the required precautions before entering someone else's non-office work area, (e.g., required PPE, training, procedure review, briefing, escort, etc.). This may involve ongoing communications with the space owner, as hazards and required safeguards may change over time. Sandia's Roving Personnel Guidelines provide additional guidance.

**Response:** Each MOW who works in a laboratory reads the appropriate TWDs and signs them. The Safe Work Practice (SWP) aspect of the Center 1100 WP&C identifies hazards and controls in the lab and personnel are 'approved' by the lab owner to work with only those hazards that they have been trained on. This approval is completed by the lab owner initialling the SWP.

## Action Messages

**1.** Contact your Division ES&H Team Industrial Hygienist to evaluate exposure to chemicals and determine control measures, prior to working with chemicals.

**Response:** IH will be contacted to perform an assessment.

**2.** Where eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for emergency quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. See Corporate Procedures ESH100.2.IH.13, Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use, for requirements.

**Response:** The eyewash/shower is tested on a regular basis.

**3.** Refer to "Record of Code Decision," with a subject of, "Storage, Dispensing, Bonding, and Grounding of Flammable and Combustible Liquids." Contact Fire Protection Engineering for assistance. See the ES&H Direct Access Services List.

**Response:** The Sandia, "Record of Code Decision," requirements will be reviewed and the implemented as necessary.

**4.** Work on energized electrical circuits is restricted to certain individuals. Ensure only qualified personnel perform work on electrical equipment/systems at SNL. It is the responsibility of the department manager to determine an employee's electrical qualifications. To become qualified to perform electrical work a person shall do the following: Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/review) or direct observation, with the hazards of the workplace and the specific equipment to be worked on, as well as any associated ES&H Standard Operating Procedures (SOPs) and Operating Procedures (OPs). Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/reference) or direct observation, with electrical maintenance techniques, codes, and other general electrical knowledge. Have qualifications reviewed and approved by their department manager to ensure they are qualified for a particular job assignment. NOTE: A person qualified to work with certain equipment may be considered "unqualified" to work on similar equipment without first being advised of any differing hazards involved.

**Response:** Only qualified personnel will perform work on electrical equipment/systems and the appropriate SOPs or OPs will be developed.

**5.** Use a technical work document (TWD) to perform energized work as follows: If the energized work is diagnostic (such as troubleshooting, measuring voltage, etc.), an OP is required. You can find an example of a completed energized electrical OP on the Electrical Safety homepage. This could easily be used as a template for any R&D electrical activity. If the work involves manipulation or reconfiguration of an energized component, an Energized Work Permit (EWP) must be completed. A EWP is needed each time such tasks are to be completed. An EWP may be obtained from the SNL internal web under Corporate Forms EWP-SF2005-EWP (10-2005).

**Response:** A TWD will be approved and followed by personnel to perform the energized work described above.

**6.** The energized work decision tool shall be used to determine PPE and hazard analysis requirements. Prior to PPE use, workers shall receive site-specific PPE training. See Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment" for requirements regarding site-specific PPE training. See MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment" for requirements.

**Response:** All requirements will be adhered to by personnel in corporate procedures ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment" regarding site-specific PPE training, MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment"

**7.** Identify PPE, shock approach, and arc flash boundary prior to operating disconnect switches. In addition, personnel shall be trained on safe switching techniques/hazards. See MN471004, Electrical Safety Manual, Sections: 2.1, "Electrical Work Requirements - General," 2.2 "Qualifications and Training," and 2.10, "Electrical Personal Protective Equipment" for requirements and guidance.

**Response:** All PPE, shock approach, and arc flash boundary will be identified prior to operating disconnect switches.

**8.** All electrical equipment that is not NRTL-listed must be evaluated by an authorized equipment inspector. Contact your ES&H Coordinator for additional information on equipment inspections or to identify an authorized equipment inspector.

**Response:** All electrical equipment that is not NRTL-listed will be evaluated by an authorized equipment inspector.

**9.** Contact the Industrial Hygienist on the appropriate Division ES&H Team to perform an exposure assessment to determine noise levels and appropriate control measures prior to performing these activities.

**Response:** IH will be contacted to perform an assessment.

**10.** As required by ES&H, Corporate Procedure: ESH100.2.ENV.22, "Manage Hazardous Waste at SNL," Members of the Workforce who are owners or generators of hazardous waste shall plan how to control hazards and appropriately manage their hazardous waste.

**Response:** All requirements in the ESH100.2.ENV.22 CP are adhered to by lab personnel.

**11.** The Manager or designee is responsible for ensuring that a Hot Work Permit and associated training is obtained from Fire Protection Engineering prior to performing Hot Work. See Corporate Procedures: ESH100.2.FP.2, "Perform Hot Work Safely" and ESH100.2.IS.3, "Weld, Cut, and Braze Safely" requirements.

**Response:** Fire Protection Engineering will be consulted prior to performing Hot Work and to ensure Hot Work Permit and associated training are obtained.

**12.** Contact the appropriate Division ES&H Team member to conduct a workplace hazard assessment for PPE requirements. This assessment must be completed prior to new or revised work with hazards that might require PPE.

**Response:** IH will be contacted to perform an assessment.

## Required Training

### PHS Identified Training

[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area. Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]

Course Code	Course Title	Exclusions	Training Interval (years)	One-time Training
CHM100	CHEMICAL SAFETY TRAINING		2	No
CHM103	SITE-SPECIFIC CHEMICAL SAFETY TRAINING		2	No
ELC106	R&D ELECTRICAL SAFETY (> 50 VOLTS)	ELC106, unless not required by the energized work decision tool	--	Yes
ELC106R	R&D ELECTRICAL SAFETY REFRESHER (> 50 VOLTS)		3	No
ELC901	SAFE SWITCHING BRIEFING		--	Yes
ENV112	HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING	(all locations other than SNL/CA will take ENV112)	1	No
ESH100	ES&H AWARENESS		1	No
ESH200	SAFETY MANAGEMENT	ESH200 for new managers only	--	Yes
FRP106	FRP106 FIRE EXTINGUISHER TRAINING (ONLINE)		1	No
LTO210	LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS		3	No
LTO220	ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS		1	No



MCH200	HAND AND POWER TOOL SAFETY	unless OJT	--	Yes
PRS150	PRESSURE SAFETY ORIENTATION	for all operators of the system	--	Yes
PRS150R	PRESSURE SAFETY ORIENTATION REFRESHER		3	No
PRS250	ADVANCED PRESSURE SAFETY	for all installers of the system	--	Yes
PRS250R	ADVANCED PRESSURE SAFETY REFRESHER		3	No
[HOTWORK]	FIRE SAFETY TRAINING PROVIDED BY FIRE PROTECTION ENGINEERING	Fire Safety Training provided by Fire Protection Engineering	--	Yes

### Regulatory Requirements

- 1: Corporate Procedure: ESH100.2.IH.20, "Maintain an Accurate Chemical and Biological Material Inventory"
- 2: Corporate Procedure: ESH100.2.IH.4, "Evaluate and Control Chemical Hazards"
- 3: Corporate Procedure: ESH100.2.IH.13, "Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use"
- 4: Corporate Procedure: ESH100.2.FP.1, "Manage Fire Protection Requirements"
- 5: Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment"
- 6: MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment"
- 7: MN471004, Electrical Safety Manual, Section 2.2, "Qualifications and Training"
- 8: MN471004, Electrical Safety Manual, Section 4.3, "Safe Work Practices"
- 9: Corporate Procedure: ESH100.2.IS.10, "Manage Industrial Machine and Portable Power Tool Safety"
- 10: MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
- 11: MN471000, Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems"
- 12: MN471000, Pressure Safety Manual, Chapter 6, "Testing and Evaluating Pressure Systems"
- 13: MN471000, Pressure Safety Manual, Chapter 7, "Verifying the Safe Operation of Pressure Systems"
- 14: MN471000, Pressure Safety Manual, Chapter 8, "Servicing Pressure Vessels and Components"
- 15: Corporate Procedure: ESH100.2.IH.8, "Evaluate and Control Noise Hazards"
- 16: Corporate Procedure: ESH100.2.ENV.6, "Control Discharges to the Sanitary Sewer System"

- 17:** Corporate Procedure: ESH100.2.ENV.12, "Obtain and Comply with Air Permits"
  
- 18:** Corporate Procedure: ESH100.2.ENV.13, "Control Ozone Depleting Substances"
- 19:** Corporate Procedure: ESH100.2.ENV.14, "Comply with Radionuclide National Emissions Standards for Hazardous Air Pollutants"
- 20:** Corporate Procedure: ESH100.1.EP.2, "Implement NEPA, Cultural Resources, and Historic Properties Requirements"
- 21:** Corporate Procedure: ESH100.2.ENV.2, "Comply with Environmental Requirements for Migratory Birds, Protected Species, and Other Biota"
- 22:** Corporate Procedure: ESH100.2.ENV.15, "Manage Hazardous Waste at SNL/CA"
- 23:** Corporate Procedure: ESH100.2.ENV.16, "Manage Radioactive Waste at SNL/CA"
- 24:** Corporate Procedure: ESH100.2.ENV.17, "Manage Mixed Waste at SNL/CA"
- 25:** Corporate Procedure: ESH100.2.ENV.20, "Manage Other Waste at SNL/CA"
- 26:** Corporate Procedure: ESH100.2.ENV.21, "Recycle or Reuse Waste at SNL/CA"
- 27:** Corporate Procedure: ESH100.2.ENV.22, "Manage Hazardous Waste at SNL/NM"
- 28:** Corporate Procedure: ESH100.2.ENV.23, "Manage Radioactive Waste at SNL"
- 29:** Corporate Procedure: ESH100.2.ENV.24, "Manage Mixed Waste at SNL"
- 30:** Corporate Procedure: ESH100.2.ENV.26, "Manage Other Waste at SNL/NM"
- 31:** Corporate Procedure: ESH100.2.FP.2, "Perform Hot Work Safely"
- 32:** Corporate Procedure: ESH100.2.IH.15, "Control Hazards Using Local Exhaust Ventilation and High Efficiency Particulate Air Filters"
- 33:** Corporate Procedure: ESH100.2.IH.3, "Control Inhalation Hazards Using Respiratory Protection"
- 34:** Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)"
- 35:** Corporate Procedure: ESH100.2.ELC.1, "Manage Electrical Hazards"
- 36:** Corporate Procedure: ESH100.2.IH.12, "Control Food and Beverage Consumption in Hazardous Areas"
- 37:** Corporate Procedure: ESH100.2.IH.17, "Address Indoor Air Quality Concerns"
- 38:** Corporate Procedure: ESH100.2.IH.21, "Control Ergonomics Hazards"
- 39:** Corporate Procedure: ESH100.2.IS.11, "Implement Housekeeping Safety"
- 40:** Corporate Procedure: ESH100.2.IS.7, "Implement Traffic Safety"
- 41:** Corporate Procedure: ESH100.3.1, "Prepare for and Manage Emergencies"
- 42:** Corporate Procedure: ESH100.4.RPT.2, "Report Injuries and Illnesses"
- 43:** Corporate Procedure: ESH100.5.RPT.5, "Report Vehicle Accidents and Property Damage"

**44:** MN471001 - ES&H Manual, Section 4B, "Electrical Safety Practices"

**45:** MN471001 - ES&H Manual, Section 4K, "Traffic Safety"

**46:** MN471001, ES&H Manual, Section 21, "Technical Work Documents (TWDs)"

**VI. Related Documents****Permits**

<b>Document Title</b>	<b>Number</b>	<b>Type</b>	<b>End Date</b>
CINT's Authority-to-Construct Permit No. 1725 Actual Date of Initial Start-up	No. 1725	Air	10/11/2004
City of Albuquerque - Wastewater Discharge Permit for CINT	2238A	Water	01/04/2007

**NEPA Documents**

<b>Document Title</b>	<b>Number</b>	<b>Project End Date</b>
CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)	SNA07-0202	
CINT Bldg. 518/1532 Installation and Operation of Low Pressure Chemical Vapor Deposition Furnace	SNA10-0201	03/11/2015

**Other Documents**

<b>Document Title</b>	<b>Number</b>	<b>Type</b>	<b>Published Date</b>
Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out	OP1100.189	OP	01/17/2008
Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories	SOP1100.001 Issue E	SOP	11/01/2010

## VII. Primary Hazard Screening Worksheets

Version of Questions:J

Version of Questions:Facility or Lab

### Interview Worksheet

	Questions	Answers
1	<b>Radiation-Generating Devices (RGDs):</b> Is there a radiation-generating device (RGD)? (Answer this question "no" if the RGDs are registered in storage.)	No
2	<b>Radioactive Materials:</b> Is radioactive material present?	No
3	<b>Explosives and Ammunition:</b> Are any explosives or ammunition (including explosive waste) managed, handled, processed, used, or stored?	No
4	<b>Lasers:</b> Do the activities covered by this PHS involve Regulated Laser Activities? Please review the definition of Regulated Laser Activities before answering this question.	No
5	<b>Chemicals:</b> <i>(Review the Help text before answering this question.)</i> Do the activities involve chemicals?	Yes
5a	Has the Industrial Hygiene Program performed an exposure assessment of the current activities conducted on Sandia-controlled premises involving chemicals that are covered by this PHS?	No
5b	Do any of the activities include?  - Hazardous waste cleanup operations (e.g., environmental restoration [ER] sites) - Treatment, storage, and disposal (TSD) facilities - Emergency response	No
5c	Will activities have, use, synthesize, or liberate unbound engineered nanoscale particles (UNP)?	No
5d	<i>(Review the help text before answering this question.)</i> Do the activities involve storage or utilization of simple asphyxiants?	Yes
5d(1)	<i>(Review the help text before answering this question.)</i> Has an exposure assessment for potential oxygen deficient atmospheres involving the use of simple asphyxiants been performed?	Yes
5d(1)a	Did the exposure assessment indicate that there is a potential for an oxygen deficient atmosphere?	No
5e	Are the hazardous chemicals, hazardous substances, or hazardous waste involved in these activities considered injurious corrosive materials?	Yes
5e(1)	Do these activities involve the use of hydrofluoric acid?	No
5f	Do these activities involve working with new chemicals (a substance which has not been listed on the TSCA Inventory List)?	No
5g	Do the activities involve the storage, dispensing, or use of flammable or combustible liquids?	Yes

Questions	Answers
<p>5h Do activities involve any of the following?</p> <ul style="list-style-type: none"> <li>- Flammable chemicals in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas (at STP) in any single container or manifolded series of containers</li> <li>- Equipment connected to a house system for flammable gases</li> <li>- Reactive chemicals in quantities greater than 1 liter of liquid, 100 g of solid, or 500 cubic feet of gas in any single container or manifolded series of containers</li> <li>- Oxidizers, other than nitric acid, in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas in any single container or process</li> <li>- Pyrophoric chemicals in total quantities greater than 500g</li> <li>- Metal powders in quantities greater than 1 kg</li> </ul>	Yes
5h(1) Is a flammable gas used for purposes OTHER THAN comfort heating or non-process hot water (e.g., restroom use)?	Yes
5h(1)a Could more than 1000 cubic feet of flammable gas be released from a single container, manifolded series of containers, or house gas system?	No
5i Do the activities include a process that involves highly hazardous chemicals at or above twenty-five percent of the Process Safety Management standard threshold quantities, or are there flammable liquids or gases involved in a process with a quantity of greater than 2,500 pounds?	No
5j Do activities use or store toxic gases in quantities greater than the de minimus quantities listed in the Help file?	Yes
5j(1) Do the activities use or store toxic gases in quantities equal to or greater than the threshold (total)quantities listed in the Help file?	No
5k <b>(Refer to help file to determine if quantities have been exceeded.)</b> Do the activities use or store hazardous chemicals in quantities equal to or greater than the <b>Emergency Management screening threshold</b> quantities?	No
<p>6 <b>Electrical:</b> Do workers conduct any of the following tasks?</p> <ul style="list-style-type: none"> <li>- Work on or near (within the limited approach boundary - 3.5 feet) exposed and energized (greater than or equal to 50 volts) electrical circuits or contact energized electrical circuit parts with tools or test probes?</li> <li>- Operate circuit breakers or disconnect switches operating at or above 50 Volts and 5 mA or more?</li> <li>- Perform non electrical work, but might contact exposed and energized electrical circuits - <i>operating at 50 volts or greater</i> - with equipment or materials, such as ladders, cranes, paint roller extensions, or forklifts?</li> <li>- Use Equipment that <b>operates at 50 Volts or more</b> and is <b>not listed</b> by an OSHA approved Nationally Recognized Testing Laboratory (e.g., UL) and operating at over 50 Volts, including extension cords and power strips?</li> </ul>	Yes

Electrical Hazards	
Source Name	
(clear and enter a source name)	

	Questions	Answers
6a	Do workers work on or near <b>(within the limited approach boundary - 3.5 feet)</b> exposed and <b>(greater than or equal to 50 volts)</b> energized electrical circuits or contact energized electrical circuit parts with tools or test probes?	Yes
6a(1)	Are <b>circuit parts</b> storing 10 Joules or more, associated with <b>Marx generators or pulsed power circuits</b> ?	No
6a(2)	Are <b>circuit parts</b> associated with <b>facility type electrical distribution systems</b> ?	No
6b	Do workers operate <b>circuit breakers</b> or <b>disconnect switches</b> operating at <b>50 Volts or more</b> and <b>5 mA or more</b> ?	Yes
6c	Do workers <b>perform non electrical work</b> , but <b>might contact exposed and energized electrical circuits - operating at 50 volts or more</b> - with equipment or materials, such as ladders, cranes, paint-roller extensions, or forklifts?	No
6d	Do workers <b>use equipment</b> that operates at 50 Volts or more and is <b>not listed</b> by an OSHA-approved Nationally Recognized Testing Laboratory (e.g., UL), including extension cords and power strips?	Yes
6d(1)	Have all of the non-NRTL approved electrical equipment or appliances been approved and documented using the Sandia non-NRTL-evaluation process?	No
7	<b>Mechanical:</b> Does the facility or activity involve any of the following hazards or activities?  <ul style="list-style-type: none"> <li>- machine shop equipment</li> <li>- portable power tools</li> <li>- powder-actuated tools</li> <li>- centrifuge operations</li> <li>- forklifts</li> <li>- motorized hand trucks</li> <li>- cranes/hoists, miscellaneous lifting devices,</li> <li>- industrial robots or industrial robotic systems</li> <li>- operate light or heavy earth-moving equipment</li> <li>- excavations</li> <li>- trenches</li> <li>- floor or wall penetrations</li> <li>- stored or kinetic mechanical energy that could cause an injury during normal working conditions</li> </ul>	Yes
7a	Do workers operate machine shop equipment?	No
7b	Do workers operate portable power tools?	Yes
7c	Do workers operate powder-actuated tools (also known as explosive-actuated fastening tools )?	No
7d	Does this facility or project activity use centrifuges?	No
7e	Are forklifts used in any operations?	No
7f	Are motorized hand trucks used in any operations?	No
7g	Are overhead cranes/hoists, mobile cranes, miscellaneous lifting devices (shop or gantry crane), or rigging used in any operations?	No
7h	Are industrial robots or industrial robotic systems used in this project or activity?	No
7i	Do workers operate light or heavy earth moving equipment?	No

	Questions	Answers
7j	Do workers perform or come into close proximity to any of these activities:	No
	- Excavations	
	- Trenches	
	- Floor or Wall Penetrations	
7k	Do activities involve stored or kinetic mechanical energy that could cause an injury under normal working conditions?	No
8	<b>Nonionizing Radiation:</b> At any time, do activities produce nonionizing radiation (NIR) (excluding lasers)?	No
9	<b>Thermal:</b> Do thermal hazards or thermal stressors exist in the work area? Please review the definition of thermal stressors before answering this question.	Yes
9a	Do thermal hazards exist in the work area in such a manner that Members of the Workforce may be exposed under normal conditions or in a foreseeable emergency?	No
9b	Do thermal stressors exist in the work area?	No
10	<b>Pressure:</b> Are workers involved in the design, installation, operation, or maintenance of a pressure system (including pressure, vacuum, cryogenic fluid applications)?	Yes
10a	Do personnel function as pressure system operators?	Yes
10b	Do personnel function as pressure installers?	Yes
10c	Do personnel handle cryogenic fluids, or design install or operate cryogenic fluid-handling systems?	No
10d	Do all systems meet the documentation requirements of the Pressure Safety Manual, Chapter 9? <b>Note:</b> Data packages on Pressure Safety Analysis Reports must reflect the current system configuration and personnel.	Yes
10e	Do supplier-established pressure ratings exist for all systems and system components?	Yes
10f	Are pressure system (or component) reevaluations being performed according to the requirements of the Pressure Safety Manual? (A common example would be the replacement or retesting of pressure relief valves.)	Yes
11	<b>Noise:</b> At any time, do sources of noise hazards exist during activities covered by this PHS?	Yes
Notes: Chase 1533 will contain (3) midsize dual vacuum pump packages and a fume scrubber. Although sound proofing mechanisms were added to the equipment, the noise level in this particular room is expected to elevate.		
11a	Has the Industrial Hygiene Program performed an exposure assessment of the potential sources of noise hazards on Sandia-controlled Premises that are covered by this PHS?	No



Questions	Answers
<p>12 <b>Miscellaneous Hazards:</b> Does the facility or activity involve any of the following hazards or activities?</p> <ul style="list-style-type: none"> <li>- Ergonomic or musculoskeletal stressors</li> <li>- Construction-like activities</li> <li>- Work with and around asbestos</li> <li>- Elevated work</li> <li>- Underwater diving</li> <li>- Animals and Hazardous Plants</li> <li>- Aircraft</li> <li>- Airborne objects</li> <li>- Firearms</li> <li>- Use of human subjects</li> <li>- Use of Sealed Drum(s)</li> </ul>	No
<p>13 <b>Outside of Manufacturer's Recommendations:</b> Does this work involve the use of <b>equipment, tools, or materials</b> outside of their design specifications or outside of the manufacturer's recommendations? (See Help Text for examples). Please enter each item into the hazard table.</p>	No
<p>14 <b>Non-Commercial Hazards:</b> Does this work involve the use of noncommercial equipment or apparatus (excluding robots, robotics systems, and equipment where the only hazard is a pressure system that has a pressure safety data package)? Please <b>enter each</b> noncommercial piece of equipment into the hazard table.</p>	No
<p>15 <b>Environmental Concerns:</b> Are there any potential <b>environmental concerns</b> with this activity that align with the SNL Environmental Management System (EMS) aspects, such as chemical use, fuel or oil storage, waste generation (except sanitary trash), construction activities, disturbance to habitat or protected species, or discharges to the air, ground surface, ground water, or the sewer systems?</p>	Yes
<p>15a <b>Wastewater:</b> Are there any wastewater discharges from this activity?</p>	Yes
<p>15a(1) <b>General Discharges:</b> Are the wastewater discharges of a general nature, such as the washing and rinsing of laboratory glassware and/or process components?</p>	Yes
<p>Notes: Fume scrubber wastewater effluent will be slightly acidic when introduced to the lab's acid waste drain. This acid waste will be processed through the facility's acid waste neutralization system.</p>	
<p>15a(2) <b>Categorical Processes:</b> Are the wastewater discharges from a categorical process or does the activity contain a zero discharge categorical process?</p>	No
<p>15a(3) Will this activity use more than 1,000 gallons of water per day?</p>	No
<p>15b <b>Air:</b> Are there any air discharges or emissions at this activity?</p>	Yes
<p>15b(1) <b>Ozone Depleting Substance (ODS):</b> Are there any <b>ODSs</b> at this activity?</p>	No
<p>15b(2) Will this activity include the installation and or use of <b>combustion equipment</b>? Combustion equipment includes boilers and internal combustion engines, such as generators.</p>	No
<p>15b(3) Will this activity involve open-burn activities?</p>	No
<p>15b(4) Will this activity involve <b>soil disturbance, building demolition, or construction</b> that <b>disturbs soil</b>, including access roads and staging areas?</p>	Yes
<p>15b(5) <b>Radionuclide NESHAP:</b> Are there any <b>radionuclide air discharges</b> or use of radionuclides in gaseous form or at elevated temperatures from this activity?</p>	No

	Questions	Answers
15c	<b>Radioactive Waste:</b> Will this activity generate any radioactive waste, or will Members of the Workforce be required to handle radioactive waste?	No
15d	<b>Hazardous Waste:</b> Will this activity generate any hazardous waste, or will Members of the Workforce be required to handle hazardous waste?	Yes
15d(1)	<b>Less-Than-90-Day Accumulation Area:</b> Will this activity store any hazardous waste in a <b>less-than-90-day accumulation area</b> ?	No
15d(2)	<b>Acutely Hazardous Waste:</b> Will this activity generate any <b>acutely hazardous waste</b> ?	No
15d(3)	<b>Waste Containing Mercury:</b> Will this activity generate any <b>waste containing mercury</b> (e.g., switches, thermometers, manometers, elemental mercury (Hg), or mercury compounds [e.g., mercuric oxide (HgO)], etc.)?	No
15e	<b>Mixed Waste:</b> Will this activity generate any <b>mixed waste</b> , or will Members of the Workforce be required to manage mixed waste?	No
15f	<b>Infectious / Biohazardous Waste:</b> Will this activity generate any infectious or biohazardous waste, or will Members of the Workforce be required to handle infectious or biohazardous waste?	No
15g	<b>Radioactive Contamination:</b> Will this activity be conducted in an area for which a reasonable potential exists for introducing <b>radioactive contamination</b> or causing activation of material that may become waste?	No
15h	<b>Material or Waste of Unknown Origin:</b> Will this activity require handling material or waste of unknown origin?	No
15i	<b>Fuels and Oil Storage:</b> Does this activity use a fuel or oil storage container capable of containing 55 gallons or more?	No
15j	<b>Discharges to Ground Surface:</b> Does this activity have a potential for any <b>discharges to the ground surface</b> ?	No
15k	<b>Improvements/modifications to structure/building exteriors and landscaping:</b> Will this project involve activities that require modifications to the exteriors of structures and buildings or modification to existing landscape, including removal of vegetation?	No
15l	<b>Disturbance to habitat or protected species:</b> Will this project involve activities that will disturb habitat or protected species, including wildlife management and outdoor projects or testing activities?	No
16	<b>Packaging and Transportation of Hazardous Materials:</b> Will any activities covered by this PHS involve the packaging and transportation of hazardous material (including explosives or radioactive material)?	No
17	<b>Fire Protection Concerns:</b> Will the activity include any of the following?  - Members of the Workforce modifying in any way any fire suppression or life safety system (fire rated walls, fire doors, fire sprinklers, fire alarm devices, fire extinguishers, or means of egress). - Members of the Workforce performing hot work in association with this facility or project activity.	Yes

Notes: Toxic gas cabinets will need to be outfitted with sprinklers to ensure cylinder cooling in the event of a fire in the area. The sprinklers will need to be tied into the lab's existing sprinkler distribution system.

17a	Will members of the Workforce <b>modify</b> in any way, any fire suppression or life safety system (e.g., fire-rated walls, fire doors, fire sprinklers, fire alarm devices, fire extinguishers, or means of egress)?	No
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	Questions	Answers
17b	Will members of the Workforce perform hot work in association with this facility or project activity? <b>Note:</b> Light laboratory soldering is not considered hot work.	Yes
17b(1)	Does the hot work include <b>welding, brazing, or torch cutting</b> ?	No
18	<b>Biological Agents:</b> ( <i>see Help text before answering this question.</i> ) Do activities involve the use of or potential exposure to biological agents?	No
19	<b>Confined Spaces:</b> Are confined spaces present in the work area?	No
20	<b>Beryllium:</b> Do operations include any activities that? ( <i>Review the Help text before answering this question</i> ) <ul style="list-style-type: none"> <li>- Use or handle beryllium, beryllium-containing alloys or beryllium oxides?</li> <li>- Create or work with <b>beryllium ceramics</b>?</li> <li>- Handle waste potentially-contaminated with beryllium or waste containing beryllium?</li> <li>- Perform <b>decontamination</b> of beryllium contamination?</li> <li>- Entail work in a beryllium contaminated building or area?</li> <li>- Apply abrasive or destructive methods to metal objects, articles, weapon components or bar stock, potentially containing beryllium?</li> <li>- Use non sparking tools containing beryllium?</li> </ul>	No
21	<b>Offsite Work:</b> Does this PHS involve any of the following? <ul style="list-style-type: none"> <li>- Work at <b>non</b>-Sandia-controlled premises</li> <li>- Work locations <b>other than</b> KAFB, SNL/CA, or TTR</li> <li>- Sandia supplying non-commercial equipment or hazardous material for use by <b>non</b>-Members of the Workforce at <b>non</b>-Sandia-controlled premises <b>or</b> locations <b>other than</b> KAFB, SNL/CA, or TTR.</li> </ul>	Yes
21a	Are there any activities at the facility that are <b>not</b> conducted on Sandia-controlled premises? This includes work done by others, such as host-site personnel	No

Questions	Answers
<p>21b Does work performed by Members of the Workforce on <b>non</b>-Sandia-controlled premises <b>or</b> locations <b>other than</b> KAFB, SNL/CA, or TTR involve any of the following (as defined in the listed PHS questions)? Please include in the question notes a brief description of all hazards driving a "yes" answer to this question, including information about the activities associated with each hazard.</p> <ul style="list-style-type: none"> <li>- radiation generating devices (question 1)</li> <li>- radioactive materials (question 2)</li> <li>- explosives (question 3)</li> <li>- lasers in navigable air space or affecting other operations (question 4b)</li> <li>- HAZWOPER operations (question 5b)</li> <li>- unbound engineered nanoparticles (question 5c)</li> <li>- newly developed chemical substance (question 5f)</li> <li>- chemical physical hazards (question 5h)</li> <li>- &gt;25% PSM quantities (question 5i)</li> <li>- toxic gases (question 5j)</li> <li>- &gt;Emergency Management screening quantities (question 5k)</li> <li>- personnel overexposure to nonionizing radiation (question 8a(1))</li> <li>- public overexposure to nonionizing radiation (question 8b(1))</li> <li>- non-routine aircraft (question 12g(1))</li> <li>- airborne objects other than aircraft (e.g., projectiles, fragments) (question 12h)</li> <li>- firearms (question 12i)</li> <li>- equipment used outside of manufacturer's recommendations with the potential to cause injury to co-located workers or public (question 13b)             <ul style="list-style-type: none"> <li>- non-commercial equipment with the potential to cause injury to co-located workers or public (see question 14b)</li> <li>- biological agents BSL-2 or higher</li> </ul> </li> </ul> <p>Notes: Toxic gases are used in this operation.</p>	Yes
21b(1) Has the SNL Safety Basis Department determined a hazard classification for these activities?	Yes
21b(1)a What hazard classification was determined by the SNL Safety Basis Department?	Low

	Questions	Answers
21c	<p>Does Sandia supply any of the following for use by <b>non</b>-Members of the Workforce on <b>non</b>-Sandia-controlled premises <b>or</b> locations <b>other than</b> KAFB, SNL/CA, and TTR? Please include in the question notes a brief description of all hazards driving a "yes" answer to this question, including information about the activities associated with each hazard.</p> <ul style="list-style-type: none"> <li>- radiation generating devices</li> <li>- radioactive material</li> <li>- explosives</li> <li>- Class 3b or Class 4 lasers where beam will be used outside</li> <li>- chemicals</li> <li>- aircraft</li> <li>- projectiles or objects that could become airborne as a result of the work</li> <li>- nonionizing radiation transmitters other than hand-held radios or Local Area Network (LAN) equipment.</li> <li>- equipment used outside of manufacturer recommendations, including modified equipment</li> <li>- non-commercial equipment, including custom-built equipment</li> <li>- biological agents BSL-2 or higher</li> </ul>	No
21d	Do these activities involve foreign travel?	No
22	<b>Roving Personnel:</b> Will any work covered by this PHS be conducted by Roving Personnel in a Sandia, non-office area (e.g. working in another organization's space)?	Yes
23	<b>Emergency Response:</b> Do activities include ES&H emergency response operations, (e.g., NEST, ARG, Hazmat, Medical)?	No
24	<b>Other Hazards:</b> Do the activities have important hazards not specifically identified elsewhere in this PHS?	No

## Controls Worksheet

	Questions	Answers
C1	<b>Local Exhaust Ventilation:</b> Do the activities covered by this PHS use local exhaust ventilation (LEV) on Sandia-controlled premises (e.g., laboratory hoods, glove boxes, downdraft tables, "elephant trunks," canopy hoods, paint booths, slot ventilation, portable welding ventilation, etc.)?	Yes

## Questions

## Answers

Notes: Furnace:

All four of the LPCVD furnace's processing tubes and TEOS source enclosure share a common 160 CFM scavenge exhaust plenum. This plenum collects any refugee fumes emitting from the processing tubes or TEOS source enclosure and directs them into the facility acid exhaust system. The furnace's source cabinet is used for the distribution of all process gasses used by the tool. This source cabinet is also connected to the facility's acid exhaust system. The exhaust flow rate through the source cabinet is set at 250 CFM. The scavenge exhaust and source cabinet exhaust are covered by Sandia's LEV program.

Support Equipment:

Two enclosed gas cabinets (Dichlorosilane and Ammonia) have independent 300 CFM exhausted connections that are tied to the facility Acid Exhaust system. These cabinets are covered by Sandia's LEV program.

Process Scrubber:

Effluent from the three process vacuum pumps associated with the LPCVD furnace travels through a dedicated fume scrubber before being introduced into the facility's acid exhaust system at a flow rate of 150 CFM. The scrubber's process outlet and 100 CFM cabinet exhaust are covered by Sandia's LEV program.

C2	<b>Personal Protective Equipment:</b> Are hazards (e.g., chemicals radiological, electrical, mechanical, thermal, flying particles and/or falling or rolling objects) encountered that are capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact?	Yes
C2a	Has a workplace hazard assessment been performed for the activities on Sandia-controlled Premises?	No
C3	<b>Control of Hazardous Energy (LOTO):</b> Do you have <b>any equipment</b> in your operations that requires any of the following activities?	Yes
	<ul style="list-style-type: none"> <li>- Construction</li> <li>- Installation</li> <li>- Setup</li> <li>- Adjustment</li> <li>- Inspection</li> <li>- Modification</li> <li>- Maintenance</li> <li>- Service</li> <li>- Lubrication</li> <li>- Cleaning</li> <li>- Unjamming</li> <li>- Making adjustments or tool changes</li> </ul>	
C3a	While performing the servicing and maintenance activities identified above, is there potential for injury from the unexpected energization or start up of the machines, equipment, or process from a release of stored energy?	Yes
C3a(1)	Will service or maintenance be done on a machine, equipment, or a process by the Members of the Workforce <b>within your organization</b> ?	Yes
C3a(1)a	Will <b>ALL</b> service or maintenance be done on a machine, equipment, or a process by the Members of the Workforce <b>within your organization</b> ?	No

Questions		Answers
C3a(1)b	During the service or maintenance can all the equipment be <b>controlled</b> by <b>cord and plug</b> ?	No
C3b	Are there <b>any</b> activities where <b>control</b> of hazardous energy sources is <b>only necessary</b> for <b>protection of configuration, equipment, or property</b> (i.e., not for personnel protection)?	Yes
C4	<b>NEPA Compliance:</b> Has this project or activity been reviewed for National Environmental Policy Act (NEPA) compliance in the ISMS NEPA Module?	Yes
Notes: Please refer to NEPA SNA10-0201 "Installation and Operation of a Low Pressure Chemical Vapor Deposition Furnace" for details.		
C4a	Are all relevant NEPA documents listed in the Documents section of this PHS?	Yes
C5	<b>Activity-Level PHS:</b> Will this PHS be used as an Activity-level PHS, in lieu of a Job Safety Analysis (JSA), for low rigor work?	No

## VIII. Hazard Analysis (HA) Section

### Hazard Analysis

Source Name or Question: **Question 5j(1)**

Source Reason: **Toxic gasses**

Hazardous Condition: **Inhalation / Potential for environmental release**

#### PHS Identified 'Low' Hazard.

**Author's Comment:** The gases of concern are Ammonia (1 lb), Chlorine (1 lb), Boron Trichloride (1 lb) and Silane (8 lbs). All are contained within gas cabinets which are designed to shut down upon detection of any leaks.

**Cause:** System/Component/Equipment Failure

The valve of the cylinder fails causing a leak.

**Consequence:** Major Illness/Injury

Personnel are exposed to gases.

**Mitigation:** Active Engineering Control-Other

The system is designed to shut off the gas if it were detected within the gas cabinet.

**Mitigation:** Procedural/TWD (SOP/OP/RWP)-Other

**Document Id:** OP1100.189, **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Personnel have read and signed off on the operating procedure.

**Mitigation:** Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of a leak at 3 times the Threshold Value Limit. A high level alarm also activates the fire alarm, notifying personnel to evacuate the building.

**Mitigation:** Training-Other

Personnel have completed site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The design of the cabinet to shut off the gas upon a leak detection, the procedure, alarm system and training are adequate controls for this hazard.



Source Name or Question: <b>Question 5h(1)a</b>
Source Reason: <b>Use or storage of flammable gasses</b>
Hazardous Condition: <b>Fire or explosion</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Regulator diaphragm failure or other component failure that results in a leak.

**Consequence:** Minor Property Damage

Fire inside of gas cabinet.

**Mitigation:** Active Engineering Control-Other

Restrictive flow orifice slows the release of gas.

**Mitigation:** Passive Engineering Control-Fire Barrier (fire wall/door/coating)

Gas enclosed in specialty designed cabinet to prevent the spread of fire.

**Mitigation:** Active Engineering Control-Fire Suppression System

Sprinkler integrated into the gas cabinet to maintain control of cylinder temperature.

**Mitigation:** Active Engineering Control-Other

Gas leak detection, shuts off gas supply at the cylinder in the event of a leak. A fusible link also breaks pneumatic air pressure to the cylinder's air operated valve when melted (~100C).

**Mitigation:** Warning Device-Audible Alarm (horn/bell/whistle)

Gas leak triggers both a local and global alarm.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The gas cabinet used to store and deliver the pyrophoric gas is specifically designed for this particular hazard (Silane).

Source Name or Question: <b>Question 6d(1)</b>
Source Reason: <b>Electrical equipment operating at 50V or greater that is not NRTL-approved</b>
Hazardous Condition: <b>Electrocution/Arcs/Fires</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Short circuit to neutral or ground.

**Consequence:** Minor Mission Disruption/Delay

Loss of power to tool and subsequent shut down.

**Mitigation:** Active Engineering Control-Other

Properly sized circuit breaker or fuse to open circuit in the event of an overcurrent situation.

**Mitigation:** Passive Engineering Control-Other

Components and wiring appropriately sized to operate well above the trip point of the overcurrent protection devices.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** Preventions/mitigations follow typical NEC guidelines and industry standards.

**Consequence:** Death [Worker]

Electrocution if the worker should provide a low impedance path through the central nervous system or heart to ground.

**Mitigation:** Active Engineering Control-Other

Incorporation of UL approved ground fault interrupt circuit protection to outlets within 6' of water sources.

**Mitigation:** Passive Engineering Control-Access Prevention Barrier (locked door/gate)

Panels with exposed terminals are not easily accessible and require a tool for removal.

**Mitigation:** Procedural (Monitoring etc.)-Other

Ground fault interrupters are tested for proper operation on a routine basis.

**Mitigation:** Active Engineering Control-Other

Emergency power off circuitry, allows the removal of power from the entire system when pressed. Requires operator intervention to restart.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** Preventions and mitigations described above follow guidelines established by the NEC and are considered to be normal measures to protect against accidental electrocution.

**Consequence:** Minor Property Damage

Electrical fire in an enclosure.

**Mitigation:** Passive Engineering Control-Fire Barrier (fire wall/door/coating)

Electrical components and power distribution circuits are in metallic enclosures.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** Components and materials of construction follow industry standards that prevent the spread of fire.

Source Name or Question: <b>Question 22</b>
Source Reason: <b>work area hazards</b>
Hazardous Condition: <b>hazards in the work area being entered that could impact personnel perform other work</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Toxic Gas Leak

**Consequence:** Death [Worker]

Fire in the facility or exposure of personnel to a toxic gas.

**Mitigation:** Warning Device-Visual Alarm (rotating beacon/flashing light/warning light)

Toxic Gas Monitoring system designed to detect shutdown the source and warn personnel in area of potential danger.

**Mitigation:** Active Engineering Control-Other

The gas cabinets are designed to shut down the hazard at the source in the event of a release.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** See previous explanation.

Source Name or Question: <b>Question 21b(1)a</b>
Source Reason: <b>Low-Level Offsite Hazardous Work Condition</b>
Hazardous Condition: <b>Potential for worker and co-located worker exposure</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Cylinder or Gas delivery valve failure.

**Consequence:** Major Illness/Injury

Personnnel are exposed to gas

**Mitigation:** Procedural/TWD (SOP/OP/RWP)-Other

**Document Id:** OP1100.189, **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Personnel performing activities that put them at risk of exposure have read and signed off on hte operating procudure.

**Mitigation:** Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of an ambient leak at three times the Threshold Limit Value. A high level alarm also activates the fire alarm notifying personnel to evacuate the building. A controlled leak detected in a ventilated enclosure will set off a low level alarm shutting off the gas at the source. An orderly evacuation of the immediate are is required when a low level leak alarm is detected.

**Mitigation:** Training-Other

Personnel have complted site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The design of the cabinet to shut off the gas upon a leak detection, the procedure, alarm system and training are adequate controls for this hazard.

**Cause:** System/Component/Equipment Failure

Regulator Diaphram failure or other coponent failure that results in a leak.

**Consequence:** Minor Property Damage

Fire in side of cabinet

**Mitigation:** Active Engineering Control-Other

Restrictive flow orifice slows the release of gas.

**Mitigation:** Passive Engineering Control-Fire Barrier (fire wall/door/coating)

Gas cylinder enclosed in a specially designed cabinet to prevent the spread of fire.

**Mitigation:** Active Engineering Control-Fire Suppression System

Sprinkler integration into the gas cabinet to maintain control of cylinder temperature in the event of a fire.

**Mitigation:** Active Engineering Control-Other

Gas leak detection shuts off gas supply at the cylander in the event of a leak. A fusable link also breaks pneumatic ari pressure to the cylinder's air operated valve if melted (~100C).

**Mitigation:** Warning Device-Audible Alarm (horn/bell/whistle)

Gas leak triggers both a local and global alarm.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The gas cabinet used to store and deliver the pyrophoric, flammable, corrosive or toxic gas is specifically designed for the specific hazard.

Source Name or Question: <b>Question 5a</b>
Source Reason: <b>Unevaluated chemical use</b>
Hazardous Condition: <b>potential chemical overexposure</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

The valve of the cylinder fails causing a leak.

**Consequence:** Major Illness/Injury

Personnel are exposed to gases.

**Mitigation:** Active Engineering Control-Other

The system is designed to shut off the gas if it were detected within the gas cabinet.

**Mitigation:** Procedural/TWD (SOP/OP/RWP)-Other

**Document Id:** OP1100.189, **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Personnel have read and signed off on the operating procedure.

**Mitigation:** Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of a leak at 3 times the Threshold Value Limit. A high level alarm also activates the fire alarm, notifying personnel to evacuate the building.

**Mitigation:** Training-Other

Personnel have completed site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The design of the cabinet to shut off the gas upon a leak detection, the procedure, alarm system and training are adequate controls for this hazard.

Source Name or Question: <b>Question 11a</b>
Source Reason: <b>Unevaluated Noise</b>
Hazardous Condition: <b>potential hearing damage</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Chase 1533 will contain (3) midsize dual vacuum pump packages and a fume scrubber.

**Consequence:** Minor Illness/Injury

Hearing impairment or loss

**Mitigation:** Procedural/TWD (SOP/OP/RWP)-Other

**Document Id:** SOP1100.001 Issue E, **Title:** Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories

**Mitigation:** Personal Protective Equipment-Other

IH will monitor the equipment to determine if PPE is required.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The SOP and PPE (if determined to be worn) will be sufficient for this hazard.

Source Name or Question: <b>Question 102a</b>
Source Reason: <b>Unevaluated hazards</b>
Hazardous Condition: <b>hazards that may require PPE</b>

**PHS Identified 'Low' Hazard.**

**Author's Comment:**

**Cause:** System/Component/Equipment Failure

Chase 1533 will contain (3) midsize dual vacuum pump packages and a fume scrubber.

**Consequence:** Minor Illness/Injury

Hearing impairment or loss

**Mitigation:** Procedural/TWD (SOP/OP/RWP)-Other

**Document Id:** SOP1100.001 Issue E, **Title:** Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories

**Mitigation:** Personal Protective Equipment-Other

IH will monitor the equipment to determine if PPE is required.

**Author Assessment of Adequacy:** Applied Mitigation and Prevention are sufficient.

**Adequacy Explanation:** The SOP and PPE (if determined to be worn) will be sufficient for this hazard.

**Note:** 22 hazard analysis(es) were not reported, because no (optional) hazard analysis was performed for them.

## IX. Supplemental Information

### PHS Input

#### Notes from Interview Questions

Q 11 - Chase 1533 will contain (3) midsize dual vacuum pump packages and a fume scrubber. Although sound proofing mechanisms were added to the equipment, the noise level in this particular room is expected to elevate.

Q 15a(1) - Fume scrubber wastewater effluent will be slightly acidic when introduced to the lab's acid waste drain. This acid waste will be processed through the facility's acid waste neutralization system.

Q 17 - Toxic gas cabinets will need to be outfitted with sprinklers to ensure cylinder cooling in the event of a fire in the area. The sprinklers will need to be tied into the lab's existing sprinkler distribution system.

Q 21b - Toxic gases are used in this operation.

#### Notes from Controls Questions

Q C1 - Furnace:

All four of the LPCVD furnace's processing tubes and TEOS source enclosure share a common 160 CFM scavenge exhaust plenum. This plenum collects any refugee fumes emitting from the processing tubes or TEOS source enclosure and directs them into the facility acid exhaust system. The furnace's source cabinet is used for the distribution of all process gasses used by the tool. This source cabinet is also connected to the facility's acid exhaust system. The exhaust flow rate through the source cabinet is set at 250 CFM. The scavenge exhaust and source cabinet exhaust are covered by Sandia's LEV program.

Support Equipment:

Two enclosed gas cabinets (Dichlorosilane and Ammonia) have independent 300 CFM exhausted connections that are tied to the facility Acid Exhaust system. These cabinets are covered by Sandia's LEV program.

Process Scrubber:

Effluent from the three process vacuum pumps associated with the LPCVD furnace travels through a dedicated fume scrubber before being introduced into the facility's acid exhaust system at a flow rate of 150 CFM. The scrubber's process outlet and 100 CFM cabinet exhaust are covered by Sandia's LEV program.

Q C4 - Please refer to NEPA SNA10-0201 "Installation and Operation of a Low Pressure Chemical Vapor Deposition Furnace" for details.



## User Entered Hazard Tables

Electrical Hazards	
Source Name	
(clear and enter a source name)	

## Assigned Reviewers

Review Type	Role	Person	Required/Requested
Technical SME	ISMS_IFSBReviewer	Stirrup,Timothy Scott	Required Review, due to: QUESTION 21b(1)
	Required Assignment: Review Question 21 and hazard-specific question sets that relate to the user-specified hazards identified in Question 21		
	Comment: [tss 01192011] IFSB review PHS Q21b for MOW performing hazardous activities at non-Sandia controlled locations. Listed operation uses toxic gases (ammonia, dichlorosilane, and silane); quantities of toxic gases do not exceed ERPG3 at 100 m; distance to public/collocated worker is greater than 100 m.		
ES&H Coordinator	ISMS_ESH_Coordinator	Starr,Michael	Required Review, by business rule.
Safety Basis	ISMS_RiskManagerA	Hall,Christopher Armando	Required Review, by business rule.
	Comment: The hazards are well documented!		
Manager	ISMS_Manager	Hearne,Sean J.	Required Review, by business rule.

## PHS Output

## Major Safety Concerns

**The hazard classification is:** Low

**The required documentation is:** PHS with integral HA

**Safety Concerns at this Low level include:**

(QUESTION 5a) potential chemical overexposure

(QUESTION 5h(1)a) Potential fire and explosion

(QUESTION 5j(1)) Potential exposure to toxic gasses in the event of a release

(QUESTION 6d(1)) unknown hazard potential since items have not gone through the standards, testing rigor, and hazard analysis associated with an NRTL-evaluation

(QUESTION 11a) potential hearing damage

(QUESTION 21b(1)a) Hazards encountered while conducting work offsite by members of the workforce

(QUESTION 22) unexpected hazards encountered by roving personnel while performing other work

(QUESTION C2a) hazards that may require PPE

## Other Safety Concerns

### Other Safety Concerns (potential hazard sources) for this: Facility or Lab

(Required by general corporate business process) traffic related hazards for injury  
(Required by general corporate business process) common electrical hazards  
(Required by general corporate business process) Roving Personnel or Visitors entering work area  
(QUESTION 5) Potential personnel exposure to chemicals & fire protection regulatory requirements  
(QUESTION 5e) Corrosive chemical; Potential exposure to skin and eyes.  
(QUESTION 5g) fire/explosion hazard  
(QUESTION 5h) hazards from fires, reactions, and explosions  
(QUESTION 6a) potential electrical shock or arc  
(QUESTION 6b) potential electrical arc from operating circuit breakers or disconnect switches  
(QUESTION 7) potential injury from mechanical forces  
(QUESTION 7b) potential injury from portable power tools  
(QUESTION 10) Injury or damage  
(QUESTION 15) potential for regulatory action  
(QUESTION 15a) potential to exceed permitted amounts  
(QUESTION 15a(1)) potential to exceed permitted amounts  
(QUESTION 15b) potential to emit regulated contaminants  
(QUESTION 15b(4)) potential for regulatory action  
(QUESTION 15d) potential for regulatory action  
(QUESTION 17b) potential for fire or burn from hot work  
(QUESTION 21a) hazards associated with the site's other activities  
(QUESTION 21d) hazards associated with domestic travel  
(QUESTION C3) potential injury to personnel from exposure to hazardous energy

## PHS Identified Training, by Source

**[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area. Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]**

CHM100: CHEMICAL SAFETY TRAINING (QUESTION 5)  
CHM103: SITE-SPECIFIC CHEMICAL SAFETY TRAINING (QUESTION 5)  
ELC106: R&D ELECTRICAL SAFETY (> 50 VOLTS) (QUESTION 6a(2))  
ELC106R: R&D ELECTRICAL SAFETY REFRESHER (> 50 VOLTS) (QUESTION 6a(2))  
ELC106R: R&D ELECTRICAL SAFETY REFRESHER (> 50 VOLTS) (QUESTION 6a(2))  
ELC901: SAFE SWITCHING BRIEFING (QUESTION 6b)  
ENV112: HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING (QUESTION 15d)

ESH100: ES&H AWARENESS (Required by general corporate business process)  
 ESH100: ES&H AWARENESS (Required by general corporate business process)  
 ESH200: SAFETY MANAGEMENT (Required by general corporate business process)  
 FRP106: FRP106 FIRE EXTINGUISHER TRAINING (ONLINE) (QUESTION 17b)  
 FRP106: FRP106 FIRE EXTINGUISHER TRAINING (ONLINE) (QUESTION 17b)  
 LTO210: LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS (QUESTION C3a(1)b)  
 LTO220: ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS (QUESTION C3a(1)a)  
 LTO220: ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS (QUESTION C3a(1)b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)  
 PRS150: PRESSURE SAFETY ORIENTATION (QUESTION 10a)  
 PRS150: PRESSURE SAFETY ORIENTATION (QUESTION 10b)  
 PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10a)  
 PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10a)  
 PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10b)  
 PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10b)  
 PRS250: ADVANCED PRESSURE SAFETY (QUESTION 10b)  
 PRS250: ADVANCED PRESSURE SAFETY (QUESTION 10b)  
 PRS250R: ADVANCED PRESSURE SAFETY REFRESHER (QUESTION 10b)  
 [HOTWORK]: FIRE SAFETY TRAINING PROVIDED BY FIRE PROTECTION ENGINEERING (QUESTION 17b)  
 [HOTWORK]: FIRE SAFETY TRAINING PROVIDED BY FIRE PROTECTION ENGINEERING (QUESTION 17b)

### Results Based on Answers and User-Entered Hazards

**The results in this PHS were based on the following answers to interview questions and user-entered hazards:**

Q 0 answered: Y; Q 5 answered: Y; Q 5a answered: N; Q 5e answered: Y; Q 5g answered: Y;  
 Q 5h answered: Y; Q 5h(1)a answered: N; Q 5j(1) answered: N; Q 6a answered: Y; Q 6a(2) answered: N;  
 Q 6b answered: Y; Q 6d(1) answered: N; Q 7 answered: Y; Q 7b answered: Y; Q 10 answered: Y;  
 Q 10a answered: Y; Q 10b answered: Y; Q 10d answered: Y; Q 10e answered: Y; Q 10f answered: Y;  
 Q 11a answered: N; Q 15 answered: Y; Q 15a answered: Y; Q 15a(1) answered: Y; Q 15b answered: Y;  
 Q 15b(4) answered: Y; Q 15d answered: Y; Q 17b answered: Y; Q 21a answered: N; Q 21b(1) answered: Y;  
 Q 21b(1)a answered: Low; Q 21d answered: N; Q 22 answered: Y; Q C1 answered: Y; Q C2 answered: Y;  
 Q C2a answered: N; Q C3 answered: Y; Q C3a(1)a answered: N; Q C3a(1)b answered: N; Q C3b answered: Y;

Q C4 answered: Y;

## X. Emergency Operations Concerns

Pressure

High Noise

Environmental Concerns

Chemical

Energized Electrical

Energized Mechanical